

CLAIMS

1. A transmitter for projecting a beam of laser light, comprising:  
a source of laser light;  
a projection arrangement for directing the laser light from said transmitter, said projection arrangement including a level vial;  
a temperature sensor circuit for detecting error induced by temperature change where said error is a function of vial temperature of said level vial itself; and  
a temperature correction circuit, responsive to said temperature sensor circuit, that adjusts said projection arrangement to compensate the direction of the laser light as a result of said error detected by said temperature sensor circuit.
2. The transmitter according to claim 1, wherein said temperature sensor circuit performs a measurement on said level vial related to the temperature thereof.
3. The transmitter according to claim 1, wherein said level vial has a level casing, and said temperature sensor circuit is configured to detect errors caused by distortion in the shape of said vial casing due to temperature change.
4. The transmitter according to claim 3, wherein said temperature sensor circuit is configured to detect asymmetrical distortion in the shape of said vial casing due to temperature change.
5. The transmitter according to claim 1, wherein said level vial has a first lead, a second lead, and a common lead, wherein inclination of said level vial is detected by monitoring a first resistance between said first lead and said common lead, and a second resistance between said second lead and said common lead.
6. The transmitter according to claim 5, wherein said level vial contains a quantity of electrically conductive fluid therein, said electrically conductive fluid defining said first and second resistances.

7. The transmitter according to claim 5, wherein said temperature sensor circuit comprises a test circuit coupled to said first, second and common leads of said level vial, said test circuit configured to provide a test signal to said level vial and monitor said first and second resistances, said first and second resistances corresponding to the temperature of said level vial.
8. The transmitter according to claim 7, wherein said test signal is provided as a signal having a predetermined voltage and short duration.
9. The transmitter according to claim 7, wherein said temperature sensor circuit further comprises a test resistance in series with said first lead of said level vial, wherein the temperature of said level vial is determined based upon a current passing through said test resistance in response to said test signal.
10. The transmitter according to claim 9, wherein said current is determined by measuring the voltage across said test resistance in response to said test signal, and computing said current.
11. The transmitter according to claim 1, further comprising a processor that provides the compensation to said temperature correction circuit using an offset grade value.
12. The transmitter according to claim 11, further comprising a lookup table accessible by said processor that stores a plurality of offset grade values and associated temperatures.
13. The transmitter according to claim 12, wherein said plurality of offset grade values comprises at least three offset grade values and corresponding predetermined temperature ranges.
14. The transmitter according to claim 12, wherein said processor calculates grade offset by applying a measured vial temperature to an interpolation of grade offsets and corresponding vial temperatures in said lookup table.

15. The transmitter according to claim 12, wherein said offset grade values are unique to a specific transmitter and level vial incorporated therein.

16. A transmitter for projecting a beam of laser light, comprising:

- a source of laser light;

- a projection arrangement for directing the laser light from said transmitter, said projection arrangement including first and second level vials, each of said first and second level vials having:

- a vial casing;

- a first lead;

- a second lead; and

- a common lead, wherein inclination is detected by monitoring a first resistance between said first lead and said common lead, and a second resistance between said second lead and said common lead.

- a temperature sensor circuit for detecting errors in reading said first and second level vial based upon the temperature of said first and second level vials themselves; and

- a temperature correction circuit, responsive to said temperature sensor circuit, that adjusts said projection arrangement to compensate the direction of the laser light as a result of said errors detected by said temperature sensor circuit.

17. The transmitter according to claim 16, wherein said temperature sensor circuit comprises:

- a level amplifier coupled to said common lead of both said first and second level vials;

- a test resistance in series with a parallel combination of said first lead of both of said first and second level vials;

- a drive circuit coupled to said test resistance and said second lead of both said first and second level vials; and

- a current sensing amplifier across said test resistance.

18. The transmitter according to claim 17, wherein said drive device provides a first voltage applied to said first leads of said first and second level vials that is generally equal in magnitude, and opposite in polarity to a second voltage applied to said second leads of said first and second level vials.

19. The transmitter according to claim 17, wherein an output of said current sensing amplifier is provided to a processor as an indication the current through said first and second level vials where the current represents an indication of the temperature of the first and second level vials.

20. A transmitter for projecting a beam of laser light, comprising:  
a source of laser light;  
a projection arrangement for directing the laser light from said transmitter, said projection arrangement including a level vial having a quantity of fluid therein;  
a temperature sensor circuit for detecting the resistance of said quantity of fluid in said level vial, said resistance being related to the temperature of said level vial, and  
a temperature correction circuit, responsive to said temperature sensor circuit, for adjusting said projection arrangement to compensate for errors in the direction of the laser light as a result of temperature induced variation in said level vial.

21. The transmitter according to claim 20, wherein:  
said temperature sensor circuit comprises:  
a test resistance in series with said conductive fluid in said level vial;  
a source configured to provide a test signal between said test resistance and said conductive fluid in said level vial; and  
a detector for detecting the voltage across said test resistance, wherein the temperature of said level vial is determined by a computation of the current through said test resistance based upon the voltage across said test resistance, and a correlation of the computed current to a temperature.

22. The transmitter according to claim 21, wherein said test signal is applied periodically and is of a predetermined voltage and short duration.

23. The transmitter according to claim 20, wherein the resistance of said electrically conductive fluid that is detected by said temperature sensor circuit characterizes distortion in the shape of a vial casing of said level vial as a result of temperature.

24. The transmitter according to claim 23, wherein the distortion in said vial casing is asymmetrical.

25. The transmitter according to claim 20, further comprising a processor that provides the compensation to said temperature correction circuit using an offset grade value.

26. The transmitter according to claim 25, further comprising a lookup table accessible by said processor that stores a plurality of offset grade values and associated temperatures.

27. The transmitter according to claim 26, wherein said plurality of offset grade values comprises at least three offset grade values and corresponding predetermined temperature ranges.

28. The transmitter according to claim 26, wherein said processor calculates grade offset by applying a measured vial temperature to an interpolation of grade offsets and corresponding vial temperatures in said lookup table.

29. The transmitter according to claim 26, wherein said offset grade values are unique to a specific transmitter and level vial incorporated therein.